



THINK of it as the DNA of the solar system. And it's coming to the Johnson Space Center.

When NASA's Genesis spacecraft returns samples of the solar wind to Earth in September, those samples will be brought to JSC. In the JSC Genesis Laboratory, scientists will assess the condition of the sample collector and then remove the samples for curation and distribution to scientists around the world for intensive study. The solar wind samples will be maintained at JSC for use by the international scientific community in much the same way that lunar, meteorite and cosmic dust samples are maintained.

Genesis is NASA's first sample return mission since the last Apollo mission in 1972 and the first ever to return material collected beyond the Moon.

The Sun contains more than 99 percent of the matter that makes up our solar system. Scientists believe that pieces of the solar wind resemble the gas of the solar nebula from which the various bodies of our solar system evolved.

Although the Sun is mostly made up of hydrogen and helium, studies suggest that there are small amounts of more than 60 other elements as well. Although scientists have some idea of how much of these elements there are from other solar missions, the exact composition of the solar wind is yet to be determined. Scientists will be determining the composition in sufficient detail to develop a clear understanding of how that chemical makeup resulted in the formation of our diverse solar system. The scientific motivation of the Genesis mission is that retrieving solar wind particles – tiny pieces of the Sun's outer layer – and analyzing them will provide increased insight into planetary formation and diversity.

"The smidgen of the Sun that will be returned and preserved in our special laboratory will help scientists better understand the composition of the original solar nebula that formed the planets, asteroids, comets and the Sun we know today," Dr. Eileen Stansbery, Assistant Director, Office of Astromaterials Research and Exploration Science (ARES) at JSC and Genesis mission Contamination Control Lead, said. "The samples will help scientists gain a better understanding of the condition in the distant past before Earth and other planets formed."

ARES curation personnel are essential members of the Genesis Science Team. ARES responsibilities are contamination control and curation. Contamination control responsibilities include ensuring the cleanliness of collection surfaces and providing a clean environment for their subsequent handling. Curation duties include storage, division and distribution of sample collectors after they are returned.

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Genesis

Searching for Genesis of the solar system

by Bill Jeffs

*Solar wind samples
coming to JSC
may hold clues*

To accomplish these tasks, JSC built two ultra-clean class 10 cleanrooms in 1999. They are NASA's cleanest laboratories, continuously flushed with air that is filtered to remove any particles larger than .12 micrometers – 1,000 times smaller in diameter than a human hair. In 2000, the Genesis payload was dismantled, cleaned and reassembled in these special cleanrooms.

The Genesis science payload was a collaborative effort between JSC, providing the ultra-clean assembly and sample curation facilities; Jet Propulsion Laboratory (JPL), providing the canister and collector arrays; and Los Alamos National Laboratory (LANL), providing the solar wind concentrator and solar wind detection instruments.

The Genesis spacecraft is now on its way back to Earth. The science phase of the mission was completed on April 1 following more than 26 months of collecting samples that began on Dec. 5, 2001. The Genesis solar collector arrays were stowed and the payload canister successfully closed, ending the collection of solar wind particles.

The samples will arrive on Earth Sept. 8 in a dramatic helicopter capture. As the sample-return capsule parachutes toward the ground at the U.S. Air Force Utah Testing and Training Range, specially trained helicopter pilots will catch the capsule in midair to prevent the delicate samples from being disturbed by the impact of a landing. The capsule will be recovered with the midair catch by Vertigo, Inc.

There will be a minimum of handling of the recovered spacecraft in Utah. Contamination requirements specify attaching a clean nitrogen purge to the science payload after recovery to prevent possible contamination of the precious samples. The science payload and all recovered hardware will come to JSC.

The JSC curation team will work with JPL and LANL to remove the sample collectors from the payload. These collectors will then be examined by JSC curation, and micrometeoroid impact features, surface defects and possible contamination haze will be mapped to help in making the samples available to the scientific community.

Two additional sample return missions are in space. NASA's Stardust spacecraft collected dust ejected from comet Wild 2 in a dramatic flyby on Jan. 2, 2004, and will return to Earth in two years. The Japanese Hayabusa mission, launched in 2003, will sample the surface of asteroid Itokawa and bring that material to Earth in about 2007. According to Dr. Carlton Allen, JSC's Astromaterials Curator, "Genesis is the first sample return mission in what promises to be a very exciting decade for planetary science."

Genesis was launched Aug. 8, 2001, from the Cape Canaveral Air Force Station in Florida. It is a NASA Discovery Mission managed by JPL for NASA's Office of Space Science in Washington, D.C. Lockheed Martin Astronautics in Denver built and designed the flight system and sample-return capsule.

Information on the JSC Genesis Team is available at:
<http://www-curator.jsc.nasa.gov/curator/genesis/>.



After its canister has been removed, the Genesis spacecraft sits in place atop the Boeing Delta II rocket in the tower at Launch Complex 17-A, Cape Canaveral Air Force Station. Genesis is on a robotic NASA space mission to catch a wisp of the raw material of the Sun and return it to Earth with a spectacular midair helicopter capture.



Here, the Genesis spacecraft opened for collection of solar wind.

Plaque ceremony honors past, sets tone for future

by Kendra Phipps

Johnson Space Center's Mission Control Center (MCC) has a firmly established vocabulary: Discipline. Morale. Tough. Competent. These are words that flight controllers and directors have lived and breathed since the early days of spaceflight.

MCC is also a place of tradition. One of its most honored rituals is the plaque-hanging ceremony, during which the people who made the mission successful place a plaque bearing the mission's patch on a Flight Control Room wall. It is considered an honor to hang the plaque, or even to hold the ladder while a teammate does.

The missions of Apollo 1, *Challenger* (STS-51-L) and *Columbia* (STS-107), however, called for a different kind of ceremony.

On April 12, the MCC team held a special plaque ceremony for all three crews that have been lost in the pursuit of space exploration. The ceremony was a way to remember the crewmembers and reiterate the commitment to tough, competent flight control.

"We have chosen, here in Mission Control, to put up these plaques to remind ourselves of the challenge of launching human beings into space from a launch pad and bringing them back again," Milt Heflin, Chief of the Flight Director Office, said. "The business of exploring space will never be free of risk. The emblems we hang today will forever remind us of our pledge" to spaceflight safety and diligence, Heflin said.

Four plaques – one for each mission, plus a new Spaceflight Memorial plaque – were hung in a diamond formation on a wall of the White Flight Control Room. In keeping with tradition, prominent flight directors from each mission were there to hang up the plaques. Also in attendance were members of each crew's families, current and former flight controllers and other JSC employees.

Apollo Flight Director Gene Kranz spoke of the earliest days of flight control before hanging the Apollo 1 plaque.

"We learned that leaders accept the burden of risk, and that an ego had no place in our business," Kranz said. After the Apollo 1 fire, he said, "we added the words 'tough' and 'competent' to our vocabulary."

Before hanging the plaque for STS-51-L, Lead Flight Director and former JSC Deputy Director Randy Stone spoke of the days leading up to *Challenger's* launch. Kelly Beck, Lead Flight Director for STS-107, acknowledged the Apollo-era flight controllers in attendance and noted that MCC's technology might have changed since their time at the controls, but not its essential principles.

"The fundamentals we operate by haven't changed," Beck said. "It's how we work; it's the basis for what we do." Beck also said that the ever-present risks involved in spaceflight have not changed.

"In Mission Control, we're always on the razor's edge between success and tragedy," she said.

After Beck hung up the STS-107 plaque, Astronaut Office Chief Kent Rominger took the podium. He praised all flight controllers in attendance and said that although "Mission Control is the epitome of professionalism," sometimes humans "learn the boundaries by crossing them."

Rominger then invited all crew family members present to hold the ladder for him while he hung the Spaceflight Memorial plaque. The new plaque features elements from all three mission patches, a large Greek "sigma" borrowed from the Mission Operations Directorate emblem, a star for each fallen crewmember and the Latin phrases for "To the stars despite adversity – Always exploring."

A ceremony was also held on the anniversary of the launch of STS-107 to honor the employees and teams who contributed to the mission. To read more, go to:

<http://www.jsc.nasa.gov/jscfeatures/articles/000000103.html>.

